

July 19, 1966

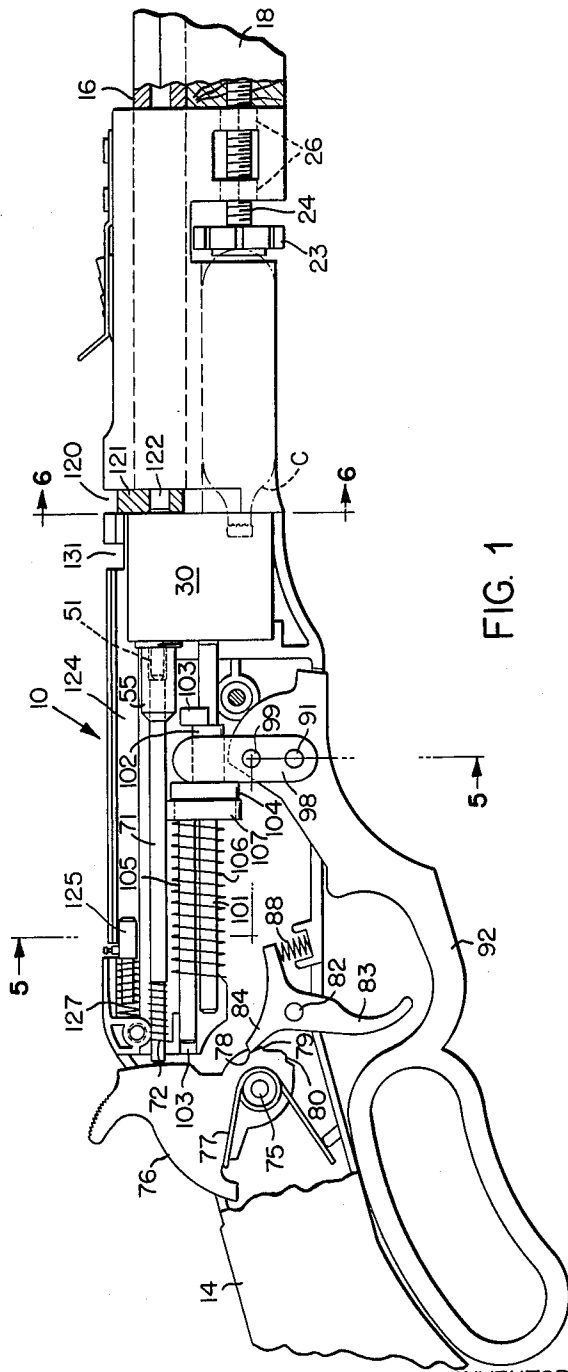
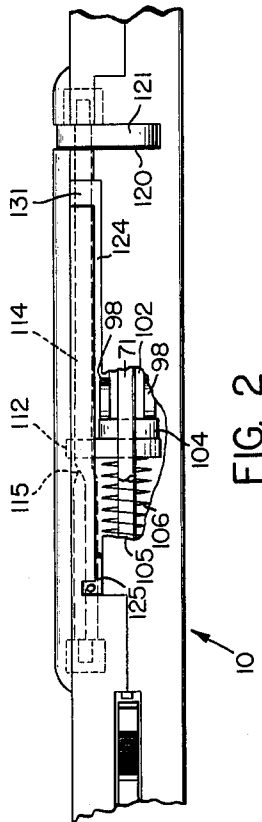
R. MERZ

3,261,341

GAS-POWERED GUN

Filed Oct. 28, 1964

2 Sheets-Sheet 1



July 19, 1966

R. MERZ
GAS-POWERED GUN

3,261,341

Filed Oct. 28, 1964

2 Sheets-Sheet 2

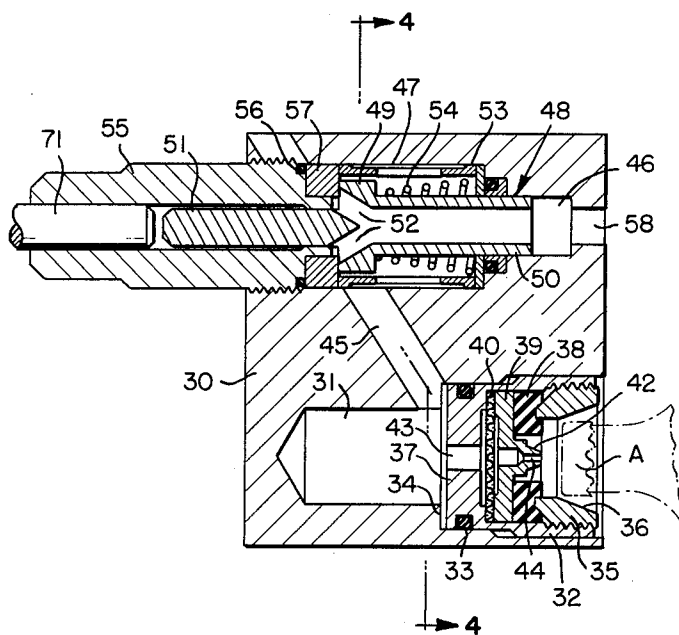


FIG. 3

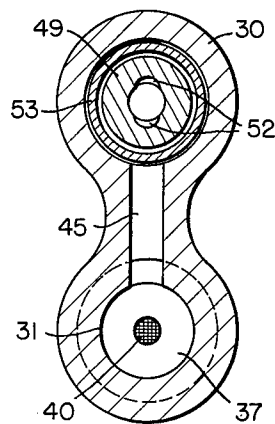


FIG. 4

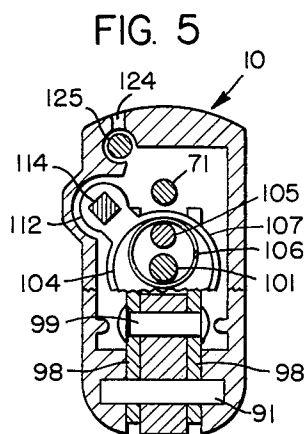


FIG. 5

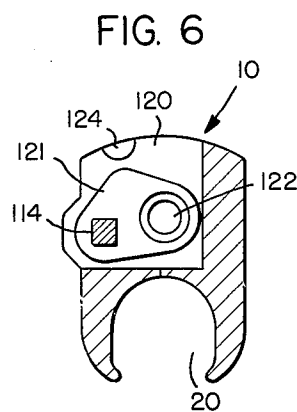


FIG. 6

INVENTOR.
RUDOLF MERZ
BY *B. E. Scheninger*
ATTORNEY

1

3,261,341

GAS-POWERED GUN

Rudolf Merz, Rochester, N.Y., assignor to Crosman Arms Company, Inc., Fairport, N.Y., a corporation of New York

Filed Oct. 28, 1964, Ser. No. 407,038
10 Claims. (Cl. 124—11)

This invention relates to guns, and more particularly to pellet type guns using replaceable CO₂ cartridges for supplying gas under pressure to propel the pellets from the guns.

Guns of the type described utilize small, bottle-shaped CO₂ cartridges. Heretofore to release the gas for use it has been general practice to mount a piercing point in the gun adjacent the cartridge cap, and to use a manually rotatable screw to move the piercing point into engagement with the cap or to move the cartridge against the piercing point to pierce the cartridge cap. The flow of CO₂ gas from the cartridge is thereafter controlled by a valve in the gun.

A disadvantage of prior guns of the type described is that it has been difficult to maintain consistent and uniform firing power throughout the life of a cartridge. Furthermore, it has been difficult for the operator to determine just how far to advance the cartridge relative to the piercer to insure proper puncturing of the cartridge cap. Moreover, it has been the practice heretofore to manufacture guns of the type described for operation at a single muzzle velocity.

One object of this invention is to provide a gun of the type described so constructed as to maintain a substantially uniform propelling force until the CO₂ charge in a cartridge is used up.

Another object of this invention is to provide an improved gas-powered gun, which may be operated selectively to discharge a projectile at relatively low or relatively high velocity.

Another object of this invention is to provide a gas-powered gun of the type described having improved means for piercing the cap of the cartridge containing the CO₂ propellant.

A more specific object of this invention is to provide an efficient, compact, gas-powered gun having a replaceable CO₂ cartridge, and means for utilizing gas from the cartridge to help pierce the cap sealing the discharge end of the cartridge.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a fragmentary side elevational view of a rifle made in accordance with one embodiment of this invention, parts thereof being broken away and shown in section;

FIG. 2 is a fragmentary plan view of this rifle with parts thereof broken away;

FIG. 3 is an enlarged, longitudinal sectional view of the valve block employed in this rifle;

FIG. 4 is a sectional view of this block on the same scale as FIG. 3, and taken along the line 4—4 in FIG. 3 looking in the direction of the arrows;

FIG. 5 is a sectional view taken along the line 5—5 in FIG. 1 looking in the direction of the arrows; and

FIG. 6 is a sectional view taken along the line 6—6 in FIG. 1 looking in the direction of the arrows.

Referring now to the drawings by numerals of reference, 10 denotes the metal frame of the rifle; 14 is the conventional wooden stock or butt; 16 denotes the barrel; and 18 the usual hand grip for supporting the forward end of the rifle when firing. The manner in which

2

the foregoing parts of the rifle are secured together forms no part of this invention.

Rearwardly of the hand grip 18 the under side of the frame 10 is provided with a recess 20 (FIG. 6) for housing a conventional CO₂ cartridge C (illustrated by broken lines in FIGS. 1 and 3), whose rounded bottom is adapted to be seated in the knurled head 23 of a screw 24, which is adjustably threaded into a pair of aligned, stationary nuts 26 carried in the forward end of frame 10 beneath the barrel 16.

Fixed in a further recess in the frame 10 rearwardly of the recess 20 is a valve block 30 (FIGS. 1 and 3). Adjacent its lower edge block 30 has a blind bore 31, the forward open end of which registers with the recess 20 coaxially of the cartridge supporting collar 23. Bore 31 is counterbored to provide intermediate its ends an internal shoulder 34. Axially slidable in this counterbore toward and away from the shoulder 34 is a sleeve or cup-shaped member 32. The member 32 is sealed with respect to the counterbore by means of a resilient O-ring 33, which is carried in a circumferential groove formed on the member 32 adjacent its inner closed end 37, and which is compressed between the member and the surrounding bore.

Threaded into the outer, open end of the member 32 is an externally threaded collar or nut 35, which has a tapered bore 36 in which the capped or discharge end of a cartridge C is adapted to be seated removably. The nut 35, through the intermediary of a rubber washer 38, serves to hold a piercing member 39, and a disk-shaped screen or filter 40, against the base of cup 32. At the forward side thereof, the piercing member 39 has a hollow, conically shaped piercing point 42, which projects into the bore of washer 38 to puncture the cap A of the cartridge C in a manner to be described in more detail below.

An axial duct 44 through the member 39 and its piercing point 42 communicates through an aligned duct 43 in the bottom 37 of member 32 with the closed or blind end of the bore 31 in the block 30; and the bore 31 is in turn connected by a duct 45 in the block 30 with a further bore or chamber 46 formed in block 30 above and parallel to the bore 31.

Slidable in bore 46 is a valve 48, which is generally similar to the valve 61 disclosed in my copending U.S. patent application Serial No. 270,849, filed April 5, 1963. At its forward end the axially bored stem portion 50 of this valve 48 is guided for sliding movement in the forward end of the bore 46; and at its rear end the solid, cylindrical stem portion 51 of the valve is slidably guided in the bore of the axially bored plug 55, which is threaded into a counterbore 47 in the rear end of bore 46, and sealed with respect thereto by a resilient O-ring 56. Intermediate its ends the enlarged diameter head portion 49 of the valve is reciprocable within a perforated sleeve 53, which is secured against movement in the counterbore 47 by means of a resilient washer 57, which surrounds the inner end of the plug 55 adjacent the ring 56. Normally the valve 48 is urged by a spring 54 into its closed, or extreme left hand position as shown in FIG. 3, wherein the outer ends of the two inclined ports 52 in its head portion 49 are pressed into sealing engagement with the face of the resilient washer 57. When the valve 48 is opened (moved to the right in FIG. 3), gas from the cartridge C passes from the duct 45, through the perforations in the sleeve 53, and the outer ends of the now open ports 52, and through the bore in the stem 50 to a duct 58 formed in the bore 46.

Slidably mounted at its rear end in the frame 10, and at its forward end in the rear end of the axial bore in plug 55, is a reciprocable valve actuating rod 71. At its rear end the rod 71 is surrounded by a coiled com-

pression spring 72 (FIG. 1), which urges the rod in a direction to maintain its forward end in contact with the rear end of the valve stem 51. The force exerted by the spring 54 on the valve 48, however, is greater than the force exerted by the spring 72 on the rod 71, so that normally the valve 48 is maintained in its closed position.

The cocking and trigger mechanism of the gun is generally similar to that shown in my U.S. Patent No. 3,119,384, and comprises a hammer 76, which is mounted to pivot about a pin 75 fixed in the frame 10, a trigger 83, which is mounted to pivot on a further pin 82 carried in the frame 10 beneath the pin 75, and a cocking lever 92, which is mounted adjacent its forward end to pivot about a pin 91 carried in frame 10.

The hammer 76 is urged in a clockwise (FIG. 1) direction about the pin 75 by a conventional torsion spring 77; and the trigger 83 is urged by a compression spring 88 to maintain the sear 84 in engagement with hammer 76. Unlike the mechanism disclosed in the above-noted patent, however, the trigger sear 84 is engageable in one of three notches 78, 79 and 80 formed in the lower end of the hammer 76.

Also, the cocking lever 92 carries at its forward end a pair of upwardly projecting arms 98 (FIGS. 1, 2 and 5), which pivot at their lower ends about pin 91, and which are connected to one another intermediate their ends by a pin or rivet 99 carried by the lever 92 above the pin 91. At their upper ends the arms 98 flank opposite sides of a sleeve 102 slidable on a stationary rod 101 fixed in the frame 10 beneath and parallel to the rod 71. Sleeve 102 at its forward end has an integral shoulder 103, and at its rear end an enlarged, integral collar 104. A rod 105 is threaded at its forward end into the rear face of the collar 104, and is slidable at its rear end through an opening 103 in the rear of frame 10 to engage and move the hammer 76 to a cocked position, when the lever 92 is pivoted as below-described. The rods 101 and 105 are surrounded by a coiled compression spring 106, which engages the rear face of collar 104 to urge the sleeve 102 forwardly on rod 101.

Mounted on the collar 104 for reciprocation therewith, is a ring 107. Projecting radially outwardly from one side of the ring 107 is a tang 112 (FIG. 5) for operating a pellet loading mechanism similar to that disclosed in my U.S. Patent No. 3,067,730. This includes a rectangular transfer rod 114 (FIGS. 2 and 5), which is twisted intermediate its ends as at 115, and which extends through a rectangular opening in the tang 112. At opposite ends thereof the rod 114 is journaled in the frame 10. Mounted on the forward end of rod 114 for pivotal movement thereby in a recess 120 formed in the frame 10 in front of the valve block 30 is a pellet transfer arm 121 (FIGS. 2 and 6). Member 121 has therethrough a circular opening 122, which is adapted to register alternately with the forward end of a magazine 124 to receive a pellet therefrom, and with the inner end of the bore in the rifle barrel 16 to deliver the pellet thereto.

The magazine 124 is loaded by drawing its plug 125 rearwardly and inserting pellets, one at a time, into the forward end of the magazine through a notch 131 (FIG. 1) formed in the magazine rearwardly of its front end and rearwardly of the transfer arm 121. For loading, the rifle is held muzzle upwardly to load pellets in the magazine. The spring-pressed plug 125 resiliently engages the rearmost pellet in the magazine to press the lead or foremost pellet into the opening 122 in the transfer arm 121, when this opening registers with the magazine.

To insert a CO₂ cartridge C into the space 20 in the underside of the frame 10, the neck or capped end of the cartridge is seated in the bore 36 of the nut 35, and the screw 24 is manually rotated to engage its head 23 with the cartridge, which in turn urges the cup member 32 into engagement with the seat 34 in valve body 30. Thereafter, further rotation of the screw 24 causes the cartridge cap A to be forced against, and to be punctured

by, the piercing point 42. As soon as the cap A has been pierced, the compressed gas in the cartridge passes through the bore 44 in the point 42 and the piercing member 39, and through the registering bore 43 in the member 32 into the bore or chamber 31. Since the valve 48 is at this time closed, the pressure of the escaping gas builds up in the chamber 31, and exerts on the bottom 37 of the member 32, because this is of relatively large area, a back pressure, which forces the cup member 32 rearwardly away from seat 34, thereby automatically forcing the piercing point 42 deeper into the cap A to complete the puncturing thereof without any additional shifting of the screw 24.

When the cocking lever 92 is pivoted counterclockwise (FIG. 1) about pin 91, the arms 98 force sleeve 102 and its collar 104 rearwardly against the resistance of spring 106, so that the rear end of the rod 105 engages and pivots the hammer counterclockwise (FIG. 1) against the resistance of the spring 77 until the trigger sear 84 engages the notch 79, thereby cocking the hammer. As the collar 104 moves rearwardly, the tang 112 on ring 107 also is moved rearwardly and traverses the twisted portion 115 of rod 114, thereby causing the rod 114 and transfer arm 121 to rotate counterclockwise from the position shown in FIG. 6, so that the opening 122 registers with the forward end of the magazine 124, thereby permitting the front pellet in the magazine to pass into the opening 122. Since the rod 114 is fixed against axial movement, it must, because of twisted portion 115, rotate in one direction as the rectangular aperture in the tang 112 moves on it toward the left in FIG. 2, and must rotate in the opposite direction, when the tang 112 is subsequently returned to the right to the position illustrated in FIG. 2, as described below.

When the cocking lever 92 is thereafter swung clockwise (FIG. 1) back to cock position, the spring 106 shifts the sleeve 102 and its collar 104 forwardly back to the position shown in FIG. 1. The trigger sear 84, however, at this time is engaged in the notch 79 so that it retains the hammer 76 in cocked position. As the collar 104 moves forwardly toward the position shown in FIG. 1, the tang 112 once again traverses the twisted portion 115 of the rod 114, so that the rod 114 and transfer arm 121 are pivoted clockwise back to the positions shown in FIG. 6, thereby transferring the pellet, which is carried in the opening 122 in the transfer arm, into firing position in registry with the forward end of the bore 58 in the valve block 30.

The rifle is now ready for firing. If desired, the hammer 76 may be manually pivoted slightly further in a counterclockwise direction (FIG. 1) before the rifle is fired. This has the effect of positioning the sear 84 in the notch 80 in the hammer, whereby, when the trigger is pressed, the blow struck by the hammer 76 against the actuating rod 71 will be greater than if the sear 84 had been positioned in the hammer notch 79. This causes rod 71 and valve 48 to be moved a correspondingly greater distance, and to be held open for a correspondingly longer period of time. Since the power of the rifle, or the velocity at which a pellet is propelled therefrom, depends in part upon the length of time the valve 48 is held open, a correspondingly higher muzzle velocity is imparted to the pellet, when the hammer is positioned so that sear 84 engages the notch 80.

In any event, when the valve 48 is unseated temporarily from the resilient washer 57, the CO₂ gas flows from chamber 31 through duct 45 and counterbore 47, through the ports 52 and duct 58 in the valve and against the rear of the pellet then held in firing position by the arm 121, propelling the pellet through and from the barrel 16. The temporarily unseated valve 48 is then returned to closed position by spring 54.

During the loading of the magazine 124, it is preferred that the hammer be manually (i.e.—without pivoting the lever 92) pivoted into "safety" position, shown in FIG. 1,

5

in which the trigger sear 84 engages in the hammer notch 78. If the trigger is then pulled to release the hammer 76, the striking force imparted by the spring 77 to the hammer is not sufficient to unseat the valve 48 from the washer 57. If desired, the hammer may also be placed in the "safety" position after the gun has been cocked, from which it would thereafter have to be manually pivoted to one of its cocked positions.

From the foregoing it will be apparent that applicant has provided an improved gas operated rifle, which is compact, sturdy, and relatively simple in operation. The automatic puncturing effect produced by the slidable member 32 in the valve block 30 insures a steady flow of CO₂ gas from the cartridge C once the latter is punctured; and the ready supply of gas in chamber 31 insures a more constant firing power. Moreover, since the chamber 31 and the counterbore 47 in the valve block 30 are constantly filled with CO₂ gas under pressure once the cartridge is punctured, it is possible to control the power of the rifle merely by moving the hammer 76 selectively into low or high power cocked positions in which the sear 84 engages the notches 79 and 80, respectively, thereby to adjust the force with which the hammer strikes the actuating rod 71. This permits the operator to conserve the CO₂ propellant by operating the rifle at high power only when necessary.

While the improved cartridge puncturing apparatus, which incorporates the piercing point 42 carried in the slidable sleeve 32, is described herein as being particularly adapted for use in a rifle, it is to be understood that it is equally adaptable for use in gas operated revolvers, either with or without a high and low power trigger mechanism of the type illustrated herein.

While the invention has been described in connection with a specific embodiment thereof, then, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A gas-powered gun, comprising

- (a) a frame having therein a recess for removably housing a capped cartridge containing gas under pressure,
- (b) a movable piercing point mounted in said frame,
- (c) means for removably mounting a gas cartridge in said recess with its capped end confronting said point, said means including manually adjustable means for shifting said capped end into puncturing engagement with said point, and
- (d) pressure-responsive means operative upon release of gas from said cartridge automatically to shift said point deeper into the capped end of said cartridge, independently of the adjustment of said mounting means.

2. A gas-powered gun as defined in claim 1, including

- (a) means operable to place a projectile in firing position in said gun, and

- (b) means operable to supply gas from said cartridge selectively in relatively large and small quantities, respectively, to the rear of the projectile, thereby to propel the projectile from the gun selectively at a relatively high and a relatively low velocity, respectively.

3. A gas-powered gun, comprising

- (a) a frame having therein a recess for housing a capped cartridge containing gas under pressure,
- (b) a stationary block mounted in said housing and having therein a blind bore, the open end of which registers with one end of said recess,
- (c) a first member mounted in said bore for limited axial movement therein,

6

- (d) a second member movably mounted in said bore between said first member and the open end of said bore to move with said first member, and having a generally cone-shaped piercing point facing the open end of said bore coaxially thereof,

- (e) means for removably mounting a gas cartridge in said recess with its capped end confronting said piercing point, said means being manually adjustable to force the capped end of said cartridge into puncturing engagement with said point,

- (f) said first and second members having therethrough registering bores disposed coaxially of said point for conducting gas released from said cartridge into said blind bore, whereby the released gas exerts a back pressure in said blind bore, which shifts said first member axially forwardly in said bore toward the cartridge, so that its point is made to penetrate deeper into the cartridge cap without further adjustment of said means.

4. A gas-powered gun as defined in claim 3, wherein

- (a) a normally closed valve is mounted in said block for controlling the flow of gas from said blind bore to the rear of a projectile disposed in a firing position in said gun,

- (b) a hammer is mounted on said frame for movement between cocked and fired positions, respectively,

- (c) means for transmitting the movement of said hammer to said valve to open the latter upon movement of said hammer from its cocked to its fired position,

- (d) a spring constantly urges said hammer toward its fired position, and

- (e) a trigger is mounted on said frame and is engageable with said hammer to hold the latter releasably and selectively in one of two different cocked positions in which the force exerted by said spring on said hammer is relatively small and relatively large, respectively.

5. A gas-operated gun, comprising

- (a) a frame containing a pair of interconnected chambers, one of which has therein a gas intake port, and the other of which has therein a gas exhaust port,

- (b) a normally-closed valve mounted in said other chamber to seal, when closed, said exhaust port,

- (c) means on said frame for removably mounting a cartridge containing gas under pressure in a recess in said frame, and adjustable to insert the discharge end of said cartridge into said intake port,

- (d) a generally conically-shaped piercing point having therethrough an axial bore, and movably mounted in said intake port to pierce the discharge end of a cartridge inserted into said intake port, thereby to conduct gas from the cartridge into said chambers through the bore in said point,

- (e) means for opening said valve to allow gas from said chambers to pass through said exhaust port to the rear of a projectile disposed in firing position in said gun, and

- (f) a movable member mounted in said intake port rearwardly of said point, and responsive to the pressure of the gas built up in said chambers upon the piercing of the discharge end of said cartridge, to force said point deeper into said discharge end independently of the adjustment of said cartridge mounting means.

6. A gas-operated gun as defined in claim 5, including

- (a) a hammer mounted on said frame for movement selectively to one of a plurality of cocked positions, and

- (b) a trigger mounted on said frame releasably to hold said hammer in one of said cocked positions, and

- (c) spring means operative upon release of said hammer to move it into operative relation with said valve temporarily to open said valve for a period of time

7

which differs for each cocked position of said hammer.

7. A gas-operated gun as defined in claim 5, wherein
(a) said movable member is sealingly mounted in said intake port for limited axial movement therein, and has therethrough an axial bore registering at its inner end with said one chamber, and at its outer end with said bore in said piercing point, and

(b) a resilient annulus surrounds said point and is sealingly engageable by the marginal edge of the discharge end of a cartridge, when the latter is inserted into piercing engagement with said point.

8. A gas-powered gun, comprising

(a) a frame,

(b) a stationary valve block mounted in said frame and having therein a pair of interconnected chambers, each of which is open at one end thereof,

(c) a sleeve mounted in the open end of one of said chambers and having in its inner end a reduced diameter bore,

(d) means sealing the opening in said one chamber around the outside of said sleeve, and operative to permit limited axial movement of said sleeve in said open end of said one chamber,

(e) means on said frame for removably mounting a cartridge filled with gas under pressure in a recess in said frame, and adjustable to insert the discharge end of the cartridge into the outer end of said sleeve coaxially thereof,

(f) a piercing member mounted in said sleeve for movement therewith, and having a conically shaped point positioned to engage and puncture the discharge end of a cartridge inserted therein, said piercing member having therethrough an axial bore, which extends through said point and communicates with said reduced diameter bore in said sleeve, to convey gas from the punctured cartridge into said chambers rearwardly of said sleeve, and

(g) a normally-closed valve mounted in the other of said chambers to control the flow of gas through the opening in said other chamber to the rear of a projectile placed in firing position in said gun,

(h) said sleeve being responsive to the pressure of the gas in said chambers, when said valve is closed, to shift the point on said piercing member deeper into the discharge end of a cartridge immediately after the puncturing thereof, and independently of the adjustment of the first-named means.

9. A gas-powered gun as defined in claim 8, wherein

(a) a resilient annulus surrounds said point on said piercing member,

8

(b) a collar is mounted in said outer end of said sleeve and has therethrough a conical bore for guiding the capped end of a cartridge into registry with said point, and

(c) a filter element is positioned between said piercing member and said inner end of said sleeve, and extends transversely between the registering bores in said sleeve and said piercing member, respectively.

10. A gas-powered gun, comprising

(a) a frame having therein a recess for housing a capped cartridge containing gas under pressure,

(b) a stationary block mounted in said housing and having therein a bore registering at one end thereof with one end of said recess,

(c) a generally cone-shaped, axially bored piercing point mounted in said bore in said block for limited axial movement therein, and with its pointed end facing said recess,

(d) movable means in said one end of said bore for supporting the capped end of a cartridge confronting said point,

(e) a screw adjustably threaded at one end into said frame and projecting at its opposite end into the opposite end of said recess to engage the bottom of a gas cartridge housed in said recess, and operative upon rotation thereof in one direction to force the capped end of the cartridge into piercing engagement with said point, and

(f) normally closed valve means mounted in said frame to communicate through the bore in said point with the interior of a gas cartridge, when the latter is pierced, and operable when open to conduct gas from a cartridge to the rear of a projectile placed in firing position in said gun,

(g) said movable means being operative in response to the release of gas into said bore in said block to move said point deeper into the capped end of a cartridge independently of any further rotation of said screw in said one direction.

References Cited by the Examiner

UNITED STATES PATENTS

2,980,096 4/1961 Merz ----- 124-11

F. BARRY SHAY, *Primary Examiner*.

RICHARD C. PINKHAM, *Examiner*.

W. R. BROWNE, *Assistant Examiner*.